

PATENT ABSTRACTS OF JAPAN

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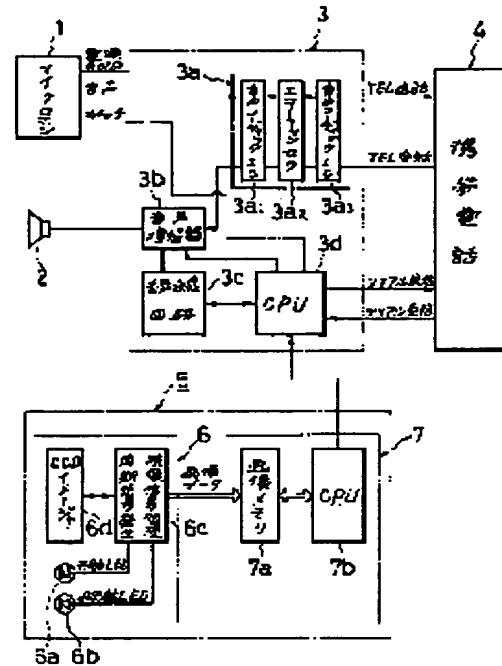
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(54) DEVICE FOR WARNING OF DANGER DURING USE OF CELLULAR PHONE

(57)Abstract:

PROBLEM TO BE SOLVED: To detect danger such that a driver is calling through a cellular phone in a vehicle so as to warn of the danger.

SOLUTION: A sight direction detector 5 which is provided to a hand-free telephone system incorporating a microphone 1 with a switch, a speaker 2, a hand-free control unit 3 and a cellular telephone 4, is composed of a CCD cameral part 6 and an image processing part 7, and an infrared LED 6a coaxial with a lens, and an infrared LED 6b non-coaxial with the lens, are alternately turned on and on. Thus obtained image data as to the eyes of the driver is transmitted to the image processing part 7. The image processing part 7 processes the data so detect a direction of the sight of the driver, and accordingly, warning is issued from the speaker 2 when it is determined that the drive gazes only in a one direction for a long time, or faces in a direction other than a driving direction for a long time.



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CLAIMS

[Claim(s)]

[Claim 1] In the telephone system constituted from an automatic in the car one in the handsfree condition so that the message by the cellular phone might be possible The direction detector of a look which detects the direction of a look of the operator at the time of cellular-phone use, and a judgment means to judge whether the above-mentioned operator has turned to the direction of [other than the fixed direction or the operation direction] beyond predetermined time by the detecting signal of the above-mentioned direction detector of a look, The risk condition alarm at the time of the cellular-phone use characterized by having an alarm means to generate an alarm according to the output of the above-mentioned judgment means.

[Claim 2] Said direction detector of a look is a risk condition alarm at the time of the cellular-phone use according to claim 1 characterized by including the CCD camera which has the infrared generator of a lens, a coaxis, and a non-coaxis, the image memory which stores the picture signal outputted from this CCD camera when this infrared generator is turned on by turns, and the image arithmetic circuit for detecting an operator's direction of a look using the image data from this image memory.

[Claim 3] It is a risk condition alarm at the time of the cellular-phone use according to claim 1 or 2 characterized by for said system to be equipped with the microphone for voice input, the switching means which controls the arrival of a cellular phone, and transmission, the loudspeaker for voice guidance, and the electronic speech circuit which generates the voice guidance signal outputted from the above-mentioned loudspeaker, and for the above-mentioned loudspeaker and an electronic speech circuit to constitute said alarm means, and to utter the voice from the above-mentioned electronic speech circuit from the above-mentioned loudspeaker according to the output of said judgment means.

[Claim 4] Said direction detector of a look is claim 2 characterized by computing an operator's direction of a look by extracting the cornea reflected image of an operator's eyes by which the image was carried out to said CCD camera, and a retinal reflex image, or a risk condition alarm at the time of cellular-phone use given in 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the risk condition alarm of the cellular phone used in the state of handsfree automatic in the car.

[0002]

[Description of the Prior Art] Recently, with the spread of cellular phones, this is used during automobile operation and resulting in accident has social-problem-ized. The handsfree telephone system which can talk over the telephone was proposed without having a cellular phone in a hand as a way stage for solving this, and it has spread. As this kind of a conventional technique, there is land mobile radiotelephone equipment indicated by JP,60-84032,A, for example.

[0003]

[Problem(s) to be Solved by the Invention] However, even when using this handsfree telephone system during automobile operation, it cannot become absorbed in the talk in a cellular phone, or the microphone can be turned to as human being's habit, and it cannot talk, or the danger that the cautions to the front will lead to its accident cannot be removed completely.

[0004] The purpose of this invention is to detect the condition that an operator becomes absorbed in the talk in a cellular phone, and says that it is as having seen the direction of [other than the operation direction] for a long time **** [, and], give an operator an alarm, and prevent the occurrence of accident in order to solve such a fault of the conventional handsfree telephone system. [having gazed at the fixed direction for a long time]

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the risk condition alarm at the time of the cellular-phone use by invention of claim 1 In the telephone system constituted from an automatic in the car one in the handsfree condition so that the message by the cellular phone might be possible The direction detector of a look which detects the direction of a look of the operator at the time of cellular-phone use, and a judgment means to judge whether the above-mentioned operator has turned to the direction of [other than the fixed direction or the operation direction] beyond predetermined time by the detecting signal of the above-mentioned direction detector of a look, Let it be a summary to have had an alarm means to generate an alarm according to the output of the above-mentioned judgment means.

[0006] The equipment of invention of claim 2 makes it a summary for said direction detector of a look to include the CCD camera which has the infrared generator of a lens, a coaxis, and a non-coaxis, the image memory which stores the picture signal outputted from this CCD camera when this infrared generator is turned on by turns, and the image arithmetic circuit for detecting an operator's direction of a look using the image data from this image memory in invention of claim 1.

[0007] The equipment of invention of claim 3 is set to claim 1 or invention of 2. Said system The microphone for voice input, and the switching means which controls the arrival of a cellular phone, and transmission, The loudspeaker for voice guidance, and the electronic speech circuit which generates the voice guidance signal outputted from the above-mentioned loudspeaker, A preparation, the above-mentioned loudspeaker, and an electronic speech circuit constitute said alarm means, and let it be a summary to have uttered the voice from the above-mentioned electronic speech circuit from the above-mentioned loudspeaker according to the output of said judgment means.

[0008] The equipment of invention of claim 4 makes it a summary for said direction detector of a look to compute an operator's direction of a look by extracting the cornea reflected image of an operator's eyes by which the image was carried out to said CCD camera, and a retinal reflex image in claim 2 or invention of 3.

[0009]

[Embodiment of the Invention] It is applied to the handsfree telephone system which consisted of automatic in the car one possible [a message] as a gestalt of operation of this invention, without an operator taking a cellular phone in his hand. A microphone for this system to input an operator's voice into a cellular phone, The switching means for inputting compaction NO. for the telephone number to a cellular phone, or controlling arrival

of the mail and transmission, The voice of the telephone which received, and the loudspeaker for outputting the voice guidance which tells operating state, The echo cancellation section which consists of the voice codec IC and echo canceller IC for canceling the echo of the voice outputted from this loudspeaker, It has the handsfree mold control unit which served as the cellular-phone electrode holder which consists of CPU for performing the communication link with control and the cellular phone of the voice amplifier which amplifies the sound signal outputted from the speech synthesis section for generating the signal of the above-mentioned voice guidance, and the above-mentioned loudspeaker, and each part of the above.

[0010] the image operation part for detecting an operator's direction of a look to the handsfree telephone system of a configuration of having mentioned above using the image data from an image memory and this image memory for an operator's direction detector of a look storing the picture signal outputted from the CCD camera which has the infrared generator of a lens, a coaxis, and a non-coaxis, and this CCD camera -- since -- it changes.

[0011] While the direction detector of a look of the above-mentioned configuration acquires the picture signal with which each infrared generator is turned on by turns and the image of the cornea of an operator's eye and a retina is expressed and stores it in an image memory, the image data from this image memory is inputted into image operation part, and detects an operator's direction of a look by the operation based on this image data.

[0012] The detecting signal of the above-mentioned look direction is sent to said CPU, and when it judges that it has gazed only at the fixed direction for a long time, or the operator has turned to it in the direction of [other than the operation direction] for a long time, he makes an alarm, as for CPU, output through a loudspeaker from speech synthesis.

[0013]

[Example] The example of this invention shown in a drawing below is explained. Drawing 1 is the block diagram showing one example of the risk condition alarm at the time of cellular-phone use of this invention. In this drawing, a loudspeaker and 3 are handsfree control units and the microphone with a switch for cellular-phone control in 1 and 2 consist of echo cancellation section 3a, voice amplifier 3b, (electronic speech circuit IC) 3c, and microcomputer (CPU) 3d. Moreover, echo cancellation section 3a consists of a voice codec IC three a1, three a3, and an echo canceller three a2. It is the direction detector of a look with which 4 is used with a cellular phone and especially 5 is used by this invention, and has the camera section 6 and the image-processing section 7. The camera section 6 consists of synchronizing signal generating [for making a lens, coaxis infrared generator (LED) 6a and a lens, infrared generator (LED) 6b of a non-coaxis, and these LED turn on by turns] and video-signal processing circuit 6c, and CCD imager 6d. Moreover, the image-processing section 7 has image memory 7a and microcomputer (CPU) 7b.

[0014] In the equipment of a configuration of having described above, at the time of transmission by the cellular phone 4, A/D conversion of an operator's voice is inputted and carried out from a microphone 1, echo cancellation of the sound signal is carried out through echo cancellation section 3a, and it is sent and sent to a cellular phone 4.

[0015] Moreover, at the time of reception by the cellular phone 4, after carrying out A/D conversion of the sound signal sent from the cellular phone 4 by echo cancellation section 3a similarly and carrying out the sampling for echo cancellations, it is outputted from a loudspeaker 2 through voice amplifier 3b. The switching means 8 attached to the microphone 1 inputs compaction NO. of a cellular phone, or is used as an object for control of arrival and transmission.

[0016] Furthermore, CPU3d performs control of electronic speech circuit 3c and voice amplifier 3b, and the input of the alarm indication signal according to the result of the direction detection of a look later mentioned from CPU7b while receiving data, such as transmission of codes, such as compaction NO. which communicated with the cellular phone 4 (serial transmission, serial reception), for example, was inputted by the switching means 8, and Arrival O.K., and a condition of a cellular phone 4.

[0017] The look measurement camera of the structure where the direction detector 5 of a look is shown in drawing 3 is used. In this drawing, non-coaxial LED6b is prepared near the 8f of the apertures which counter lens 6e, and coaxial LED6a is attached in the lens-holder 6g posterior part. As for 6h, half mirror 6h and the image-processing section 7 grade of a half mirror and 6i are the processing substrates formed.

[0018] the direction detector 5 of a look is shown in drawing 2 -- as -- the vehicle interior of a room -- setting -- the location 9 which can detect an operator's look, for example, a handle, -- it is attached a little in the location on the right-hand side of the upper part.

[0019] In the direction detector 5 of a look of the structure mentioned above, the CCD camera section 6 stores in image memory 7a in the image-processing section 7 the picture signal of the cornea reflected image of the eye of the operator who shows LED 6a and 6b to drawing 5 obtained by switching on the light by turns, and a retinal reflex image. It computes an operator's direction of a look by CPU7b reading image data from image memory 7a, and processing a flow like drawing 8 .

[0020] Drawing 4 is explanation of the principle of the direction detection of a look, and the explanatory view in

, which (a) shows a condition when an operator looks at the direction of lighting 15, and (b) are the explanatory views showing a condition when an operator looks at the direction of the camera lens 13. Thus, if an operator shifts a look, a cornea reflected image will move only the part which shifted the look to the retinal reflex image of the image of the eye by which the image was carried out to a camera image pick-up side. Since the center position 11 (alpha) and the cornea reflected image 12 (beta) of a pupil image (retinal reflex image) change from this drawing (a) by observing a rotation of an eyeball 10 with a CCD camera as shown in (b), the direction of a look is detectable from the amount of location gaps of alpha and beta (Δh , Δv) shown in drawing 6 (calculation). In addition, as for a camera lens and 14, 13 is [a camera image pick-up side and 15] lighting. [0021] It is the processing flow of the image data for the direction detection of a look of CPU7b, and at step S1, drawing 8 incorporates the picture signal at the time of a common LED exposure, by step S2, it incorporates the picture signal at the time of a non-coaxial LED exposure, generates the differential signal between both picture signals at step S3, and generates the binary image shown in drawing 7 (a) from this partial signal by step S4. After creating a respectively well-known run length list at steps S5 and S6 to this binary image, labeling processing is performed, that center of gravity (alpha) is computed, subsequently the cornea reflected image (beta) of drawing 7 (b) is extracted [a retinal reflex image is extracted at step S7,] at step S8, and the direction of a look is computed in step S9 from the amounts Δh and Δv of location gaps of drawing 6 . Whether for example, the direction of a look is fixed judges for 15 seconds from the obtained direction detecting signal of a look, at step S10, if it is no N, it will return to step S1, but if it is yes Y, an alarm indication signal will be sent to CPU3d of the handsfree control unit 3 at step S11, and it will return to step S1.

[0022] Thus, when an operator's look does not change beyond fixed time amount (15 seconds), or when a look swerves from the front, it is judged as a risk condition and said alarm indication signal is outputted. CPU3d generates an alarm signal from electronic speech circuit 3c, and the handsfree control unit 3 generates the voice from a loudspeaker 2, when an alarm indication signal is received from the direction detector 5 of a look.

[0023]

[Effect of the Invention] As explained above, according to this invention, by warning of the danger cellular-phone in use [under automobile operation], accident can be prevented beforehand and the effectiveness of a handsfree telephone system improves more.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the risk condition alarm of the cellular phone used in the state of handsfree automatic in the car.

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PRIOR ART

[Description of the Prior Art] Recently, with the spread of cellular phones, this is used during automobile operation and resulting in accident has social-problem-ized. The handsfree telephone system which can talk over the telephone was proposed without having a cellular phone in a hand as a way stage for solving this, and it has spread. As this kind of a conventional technique, there is land mobile radiotelephone equipment indicated by JP,60-84032,A, for example.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, even when using this handsfree telephone system during automobile operation, it cannot become absorbed in the talk in a cellular phone, or the microphone can be turned to as human being's habit, and it cannot talk, or the danger that the cautions to the front will lead to its accident cannot be removed completely.

[0004] The purpose of this invention is to detect the condition that an operator becomes absorbed in the talk in a cellular phone, and says that it is as having seen the direction of [other than the operation direction] for a long time **** [, and], give an operator an alarm, and prevent the occurrence of accident in order to solve such a fault of the conventional handsfree telephone system. [having gazed at the fixed direction for a long time]

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the risk condition alarm at the time of the cellular-phone use by invention of claim 1 In the telephone system constituted from an automatic in the car one in the handsfree condition so that the message by the cellular phone might be possible The direction detector of a look which detects the direction of a look of the operator at the time of cellular-phone use, and a judgment means to judge whether the above-mentioned operator has turned to the direction of [other than the fixed direction or the operation direction] beyond predetermined time by the detecting signal of the above-mentioned direction detector of a look, Let it be a summary to have had an alarm means to generate an alarm according to the output of the above-mentioned judgment means.

[0006] The equipment of invention of claim 2 makes it a summary for said direction detector of a look to include the CCD camera which has the infrared generator of a lens, a coaxis, and a non-coaxis, the image memory which stores the picture signal outputted from this CCD camera when this infrared generator is turned on by turns, and the image arithmetic circuit for detecting an operator's direction of a look using the image data from this image memory in invention of claim 1.

[0007] The equipment of invention of claim 3 is set to claim 1 or invention of 2. Said system The microphone for voice input, and the switching means which controls the arrival of a cellular phone, and transmission, The loudspeaker for voice guidance, and the electronic speech circuit which generates the voice guidance signal outputted from the above-mentioned loudspeaker, A preparation, the above-mentioned loudspeaker, and an electronic speech circuit constitute said alarm means, and let it be a summary to have uttered the voice from the above-mentioned electronic speech circuit from the above-mentioned loudspeaker according to the output of said judgment means.

[0008] The equipment of invention of claim 4 makes it a summary for said direction detector of a look to compute an operator's direction of a look by extracting the cornea reflected image of an operator's eyes by which the image was carried out to said CCD camera, and a retinal reflex image in claim 2 or invention of 3.

[0009]

[Embodiment of the Invention] It is applied to the handsfree telephone system which consisted of automatic in the car one possible [a message] as a gestalt of operation of this invention, without an operator taking a cellular phone in his hand. A microphone for this system to input an operator's voice into a cellular phone, The switching means for inputting compaction NO. for the telephone number to a cellular phone, or controlling arrival of the mail and transmission, The voice of the telephone which received, and the loudspeaker for outputting the voice guidance which tells operating state, The echo cancellation section which consists of the voice codec IC and echo canceller IC for canceling the echo of the voice outputted from this loudspeaker, It has the handsfree mold control unit which served as the cellular-phone electrode holder which consists of CPU for performing the communication link with control and the cellular phone of the voice amplifier which amplifies the sound signal outputted from the speech synthesis section for generating the signal of the above-mentioned voice guidance, and the above-mentioned loudspeaker, and each part of the above.

[0010] the image operation part for detecting an operator's direction of a look to the handsfree telephone system of a configuration of having mentioned above using the image data from an image memory and this image memory for an operator's direction detector of a look storing the picture signal outputted from the CCD camera which has the infrared generator of a lens, a coaxis, and a non-coaxis, and this CCD camera -- since -- it changes.

[0011] While the direction detector of a look of the above-mentioned configuration acquires the picture signal with which each infrared generator is turned on by turns and the image of the cornea of an operator's eye and a retina is expressed and stores it in an image memory, the image data from this image memory is inputted into image operation part, and detects an operator's direction of a look by the operation based on this image data.

[0012] The detecting signal of the above-mentioned look direction is sent to said CPU, and when it judges that it has gazed only at the fixed direction for a long time, or the operator has turned to it in the direction of [other than the operation direction] for a long time, he makes an alarm, as for CPU, output through a loudspeaker from speech synthesis.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing one example of this invention.

[Drawing 2] It is the perspective view showing an example of the vehicle indoor layout of the above-mentioned example.

[Drawing 3] It is the front view (a), sectional view (b), and top view (c) showing an example of the direction detector of a look.

[Drawing 4] In explanation of the principle of the direction detection of a look, the explanatory view in which (a) shows a condition when an operator looks at the direction of lighting, and (b) are the explanatory views showing a condition when an operator looks at the direction of a camera lens.

[Drawing 5] It is the image Fig. of the eye obtained by the CCD camera.

[Drawing 6] It is the explanatory view showing the calculation approach of the amount of location gaps for the direction detection of a look.

[Drawing 7] With the explanatory view of an extract of a retina and a cornea reflected image, the explanatory view in which (a) shows a binary image, and (b) are the explanatory views showing a non-coaxial system image.

[Drawing 8] It is the processing flow chart of the direction calculation of a look.

[Description of Notations]

1 Microphone

2 Loudspeaker

3 Handsfree Control Unit

3c Electronic speech circuit

3d CPU

4 Cellular Phone

5 The Direction Detector of Look

6 Camera Section

6a Coaxis LED

6b The non-coaxis LED

7 Image-Processing Section

7a Image memory

7b CPU

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EXAMPLE

[Example] The example of this invention shown in a drawing below is explained. Drawing 1 is the block diagram showing one example of the risk condition alarm at the time of cellular-phone use of this invention. In this drawing, a loudspeaker and 3 are handsfree control units and the microphone with a switch for cellular-phone control in 1 and 2 consist of echo cancellation section 3a, voice amplifier 3b, (electronic speech circuit IC) 3c, and microcomputer (CPU) 3d. Moreover, echo cancellation section 3a consists of a voice codec IC three a1, three a3, and an echo canceller three a2. It is the direction detector of a look with which 4 is used with a cellular phone and especially 5 is used by this invention, and has the camera section 6 and the image-processing section 7. The camera section 6 consists of synchronizing signal generating [for making a lens, coaxial infrared generator (LED) 6a and a lens, infrared generator (LED) 6b of a non-coaxis, and these LED turn on by turns] and video-signal processing circuit 6c, and CCD imager 6d. Moreover, the image-processing section 7 has image memory 7a and microcomputer (CPU) 7b.

[0014] In the equipment of a configuration of having described above, at the time of transmission by the cellular phone 4, A/D conversion of an operator's voice is inputted and carried out from a microphone 1, echo cancellation of the sound signal is carried out through echo cancellation section 3a, and it is sent and sent to a cellular phone 4.

[0015] Moreover, at the time of reception by the cellular phone 4, after carrying out A/D conversion of the sound signal sent from the cellular phone 4 by echo cancellation section 3a similarly and carrying out the sampling for echo cancellations, it is outputted from a loudspeaker 2 through voice amplifier 3b. The switching means 8 attached to the microphone 1 inputs compaction NO. of a cellular phone, or is used as an object for control of arrival and transmission.

[0016] Furthermore, CPU3d performs control of electronic speech circuit 3c and voice amplifier 3b, and the input of the alarm indication signal according to the result of the direction detection of a look later mentioned from CPU7b while receiving data, such as transmission of codes, such as compaction NO. which communicated with the cellular phone 4 (serial transmission, serial reception), for example, was inputted by the switching means 8, and Arrival O.K., and a condition of a cellular phone 4.

[0017] The look measurement camera of the structure where the direction detector 5 of a look is shown in drawing 3 is used. In this drawing, non-coaxial LED6b is prepared near the 8f of the apertures which counter lens 6e, and coaxial LED6a is attached in the lens-holder 6g posterior part. As for 6h, half mirror 6h and the image-processing section 7 grade of a half mirror and 6i are the processing substrates formed.

[0018] the direction detector 5 of a look is shown in drawing 2 -- as -- the vehicle interior of a room -- setting -- the location 9 which can detect an operator's look, for example, a handle, -- it is attached a little in the location on the right-hand side of the upper part.

[0019] In the direction detector 5 of a look of the structure mentioned above, the CCD camera section 6 stores in image memory 7a in the image-processing section 7 the picture signal of the cornea reflected image of the eye of the operator who shows LED 6a and 6b to drawing 5 obtained by switching on the light by turns, and a retinal reflex image. It computes an operator's direction of a look by CPU7b reading image data from image memory 7a, and processing a flow like drawing 8.

[0020] Drawing 4 is explanation of the principle of the direction detection of a look, and the explanatory view in which (a) shows a condition when an operator looks at the direction of lighting 15, and (b) are the explanatory views showing a condition when an operator looks at the direction of the camera lens 13. Thus, if an operator shifts a look, a cornea reflected image will move only the part which shifted the look to the retinal reflex image of the image of the eye by which the image was carried out to a camera image pick-up side. Since the center position 11 (alpha) and the cornea reflected image 12 (beta) of a pupil image (retinal reflex image) change from this drawing (a) by observing a rotation of an eyeball 10 with a CCD camera as shown in (b), the direction of a look is detectable from the amount of location gaps of alpha and beta (delta h, delta v) shown in drawing 6 (calculation). In addition, as for a camera lens and 14, 13 is [a camera image pick-up side and 15] lighting.

[0021] It is the processing flow of the image data for the direction detection of a look of CPU7b, and at step S1, drawing 8 incorporates the picture signal at the time of a common LED exposure, by step S2, it incorporates the

picture signal at the time of a non-coaxial LED exposure, generates the differential signal between both picture signals at step S3, and generates the binary image shown in drawing 7 (a) from this partial signal by step S4. After creating a respectively well-known run length list at steps S5 and S6 to this binary image, labeling processing is performed, that center of gravity (alpha) is computed, subsequently the cornea reflected image (beta) of drawing 7 (b) is extracted [a retinal reflex image is extracted at step S7,] at step S8, and the direction of a look is computed in step S9 from the amounts delta h and delta v of location gaps of drawing 6 . Whether for example, the direction of a look is fixed judges for 15 seconds from the obtained direction detecting signal of a look, at step S10, if it is no N, it will return to step S1, but if it is yes Y, an alarm indication signal will be sent to CPU3d of the handsfree control unit 3 at step S11, and it will return to step S1.

[0022] Thus, when an operator's look does not change beyond fixed time amount (15 seconds), or when a look swerves from the front, it is judged as a risk condition and said alarm indication signal is outputted. CPU3d generates an alarm signal from electronic speech circuit 3c, and the handsfree control unit 3 generates the voice from a loudspeaker 2, when an alarm indication signal is received from the direction detector 5 of a look.

[Translation done.]

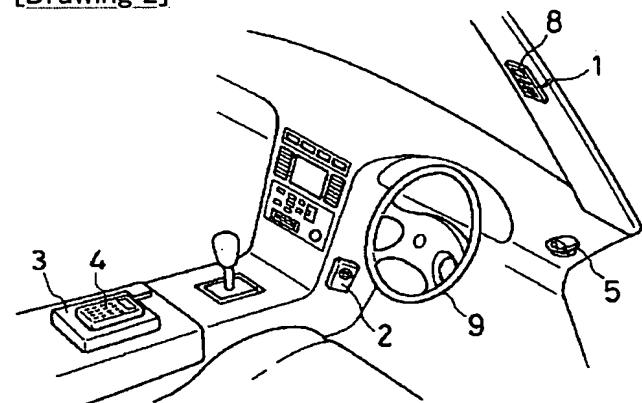
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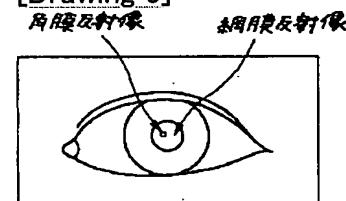
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3. In the drawings, any words are not translated.

DRAWINGS

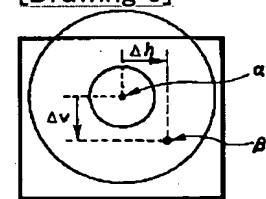
[Drawing 2]



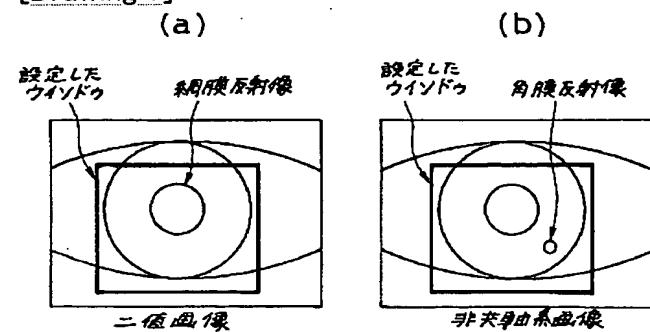
[Drawing 5]



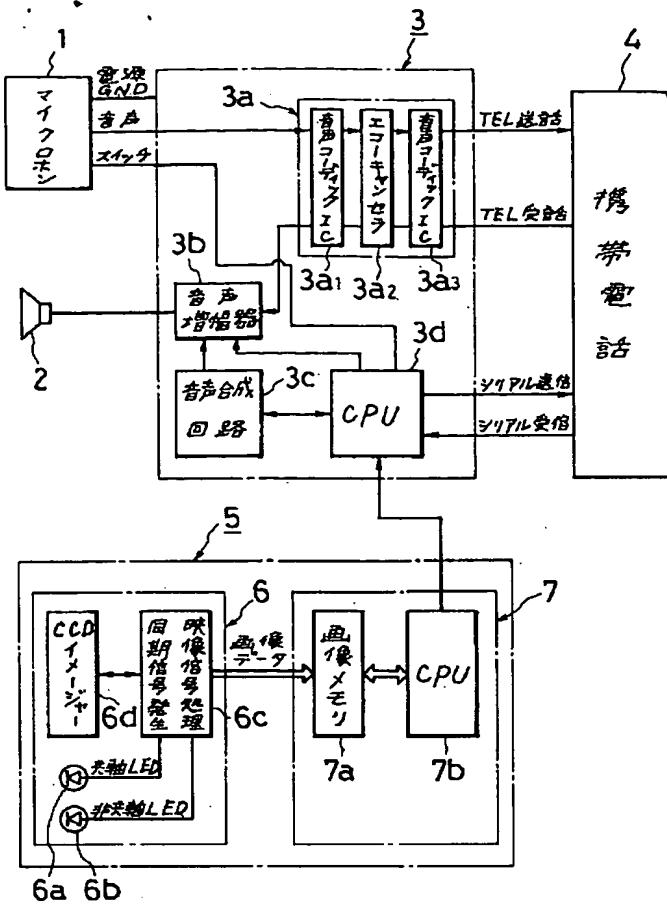
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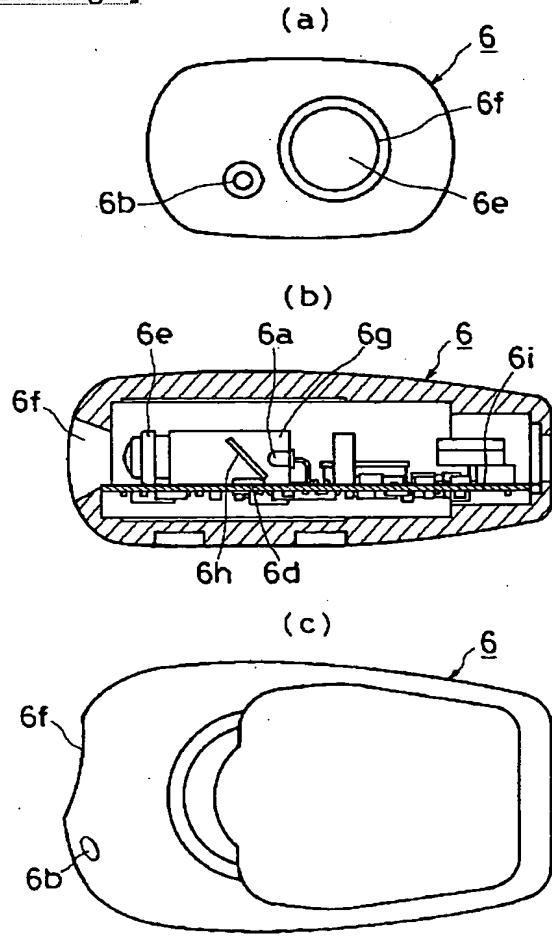
[Drawing 7]



[Drawing 1]

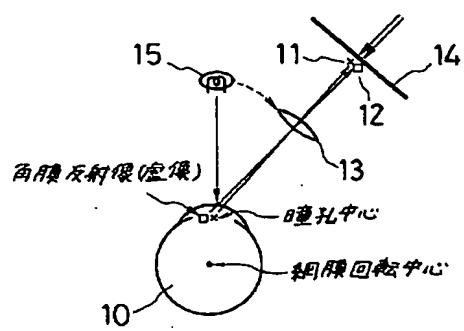


[Drawing 3]

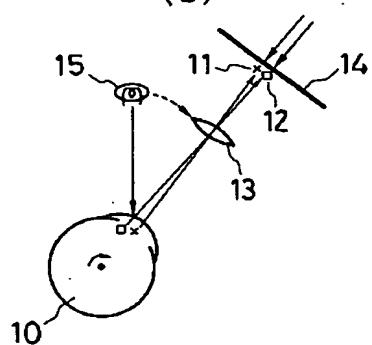


[Drawing 4]

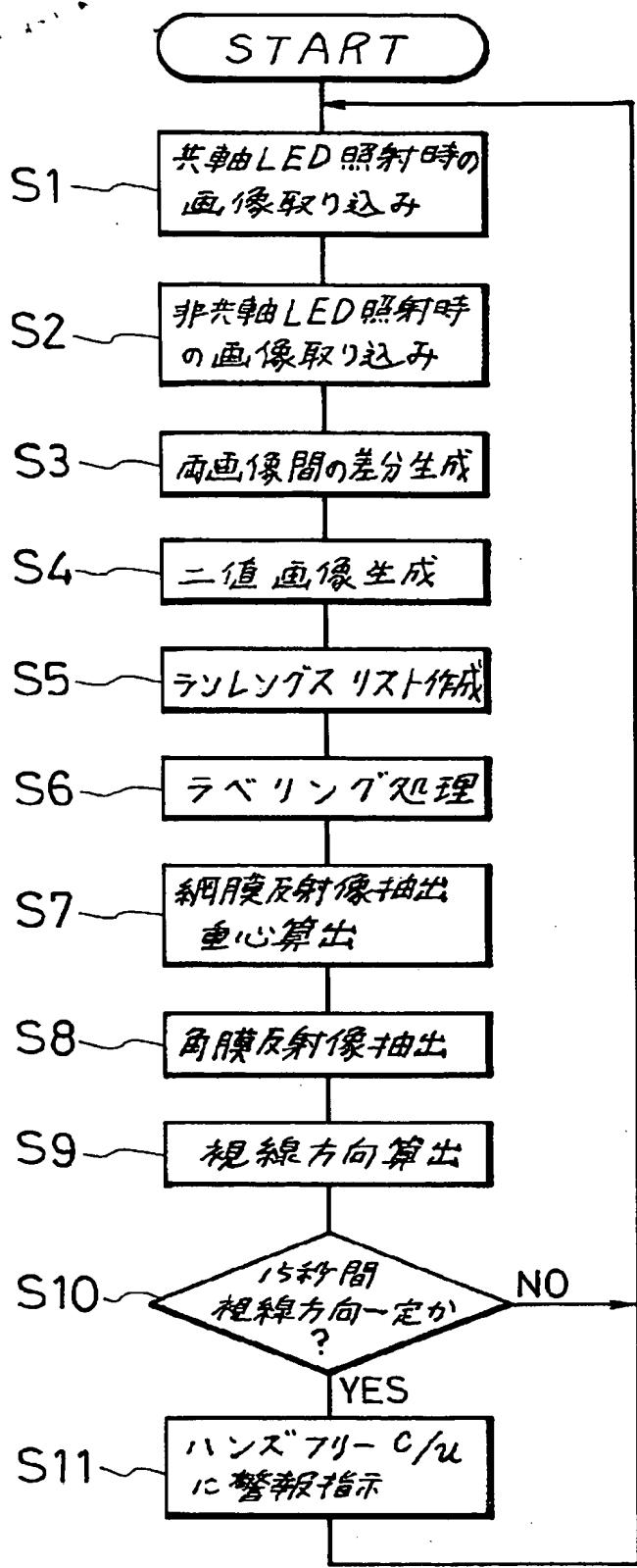
(a)



(b)



[Drawing 8]



[Translation done.]

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